RESEARCH AND ANALYSIS OF S&T COMMUNICATIONS TACTICS AND RELATED BEST PRACTICES IN THE CANADIAN FEDERAL GOVERNMENT

PRESENTED TO THE COUNCIL OF SCIENCE AND TECHNOLOGY ADVISORS

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INTRODUCTION

OBJECTIVE

The objective of this report is to examine the principles, guidelines and strategies that govern S&T communications in a cross-section of departments and agencies of the Government of Canada, and identify best practices. Germane to this examination is a discussion of the context in which these communications activities occur. Finally, this report will make a number of recommendations with a view to improving the manner in which the value of government science and technology is communicated to Canadians.

BACKGROUND

A key message in the CSTA's report Science Advice for Government Effectiveness (SAGE) is that government decision-making occurs in a highly dynamic environment. An increasingly sophisticated public demands access to ever-greater amounts of information, and a more active public role in decision-making. However, as SAGE states, "there is a greater public scepticism of science, government, industry, and the interactions among them"[1]. While focusing on science advice, SAGE concludes that, "greater science literacy and better communication of scientific uncertainty will increase the population's understanding of the capabilities and limitations of science"[2].

The CSTA's second report Building Excellence in Science and Technology (BEST) identified four key roles for the Government of Canada in performing S&T[3]:

- support for decision-making, policy development and regulations;
- development and management of standards;
- support for public health, safety, environmental and/or defence needs; and
- and enabling economic and social development.

In support of these roles, it is critical that the government also undertake public outreach and communications efforts. If the Canadian public is to support decisions taken on the

[1] Science Advice for Government effectiveness (SAGE), Council of Science and Technology Advisors, May 5, 1999, page 2.

[2] Ibid.

[3] Building Excellence in Science and Technology (BEST): The Federal Roles in Performing Science and Technology, Council of Science and Technology Advisors, December 16, 1999, page 15.

basis of scientific evidence, they must be assured about the process by which that advice is formulated, and that the conclusions are correctly drawn.

As the CSTA's report Science and Technology Excellence in the Public Service (STEPS) states, "public confidence is elusive and fragile. It is influenced by the incidence of crises and opportunities lost... The communications challenge for the government is to demonstrate to the public that S&T has enhanced the government's ability to respond to challenges and capitalize on the opportunities afforded by S&T"[4]. To help foster excellence, STEPS recommends that departments and agencies "include communications and publications strategies in program and project planning documents and ...publish or otherwise make available information on all funded S&T projects"[5].

If the full value of government S&T that informs decisions in policy areas such as public health and safety, the environment, innovation and wealth creation, resource extraction, and defence and national security, is to be recognized and appreciated by Canadians, they need to aware of the work that is undertaken in federal government labs, and field stations. While science cannot always provide conclusive answers about the nature and extent of risks, public confidence will likely increase in manner commensurate with the amount of public information.

APPROACH AND METHODOLOGY

An interview guide was prepared and circulated to a number of Government of Canada officials employed by the primary science-based departments and agencies (SBDA). Those interviewed work in specific science and technology fields, science policy and communications. An interview session was also conducted with the members of the 5NR Communications Working Group, comprised of science policy and communications officials from Agriculture and Agri-Food Canada, Environment Canada, Fisheries and Oceans, Health Canada and Natural Resources Canada.

Following the primary interviews, telephone conversations were held with several of these officials to obtain additional information, and other officials we were referred to for questions on specific aspects of communications policy such as community engagement and consultation, and the production of targeted communications products.

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[4] Science and Technology Excellence in the Public Service (STEPS), Council of Science and Technology Advisors, August 2001, Page 29.

[5] Ibid., p. 16.

OVERVIEW OF KEY THEMES

Science is cool, scientists are cool

SCIENTISTS ARE COOL

Scientists tend to be opinionated, often brilliant, frequently unusual, and always passionate about their work. The scientists that we talked to are highly dedicated to their work and love to talk about it. Scientists pride themselves on asking provocative questions, raising tough issues, and stimulating discussion so that they can accelerate the pace of discovery.

Scientists are cool. Canadians recall Catriona Le May Doan flashing to victory in Salt Lake City last February. What they would not have known is that Le May Doan put her speed skating suit through rigorous wind resistance tests conducted by the National Research Council. Not all government science is this glamorous but much of it can stir the imagination.

Canadians have been inspired by Marc Garneau, Roberta Bondar, Chris Hadfield, and Julie Payette as they viewed the stars from the heavens. Federal biologists and geologists comb Canada's endless summits for clues to the past that may predict the future. Scientists from the Government of Canada are working to preserve Canada's natural heritage for generations to come. Researchers from federal departments are trying to unlock the mysteries of the deep, while attempting to provide solutions to many of the natural problems that continue to plague Canadian agriculture.

SCIENCE IS COOL...AND RELEVANT

To illustrate this point, consider three science-related functions undertaken by the National Research Council: astronomy, technology clustering, and the time signal. These three items in fact, highlight the key science streams in terms of interest to the public. The

first represents science that satisfies human curiosity, intrigues the natural sense of enquiry in all of us, and appeals at different intellectual and sensory levels to different age cohorts.

The second function has beneficial economic and social consequences for individuals and communities, both in a scientific and geographical sense. Technology clusters are a clear example of "science at work for Canada".

Finally, the time signal satisfies a need for instant information for immediate use in our busy day-to-day lives. It is also representative of the type of scientific activity that could not or would not be contracted out or commercialized; no one is going to make any money on it!

Clearly, Canadians are interested in science. Millions of Canadian gardeners benefit from the plant hardiness zones map developed by Natural Resources Canada. The most recent map was created using 30 years of cumulative climate data. This product illustrates the dichotomy between the discovery to innovation timeframe, and that of our media news cycle of 24 hours or less.

Last year, the National Research Council provided hundreds of thousands of periodic tables of the elements to Canadian science students and their star chart is among the most popular products of Canadian science.

Science underpins the security of our country, and supports our Armed Forces in trouble spots across the globe. The food we eat, the water we drink, the homes we live in benefit from the accumulated legacy of federal government science.

SCIENTISTS ARE COOL ... AND CLOSE TO CANADIANS

Scientists employed by the Government of Canada undertake their voyages of discovery in traditional laboratories, in weather stations in remote locations, in research vessels far off our coasts, in field stations dotted across the map of Canada in forests, wetlands, and alpine meadows, in areas of conflict around the globe, and beyond the binds of earth's gravity. This diversity of S&T research, and the variety of locations in which it occurs offers unique opportunities for communication with Canadians about the value of government science.

For example, the work of scientists with Environment Canada (EC) is close to the community in a number of different ways: meteorologists helping Canadians plan their days and apparel; providing risk assessments of new and existing toxics; field biologists explaining the world around us; community environmental remediation and restoration programs; and monitoring programs such as the annual Christmas bird count, that depend upon an engaged citizenry.

Hand in hand with this community level interface, is a communications approach that brings scientists out from behind their benches and out of their field tents, that encourages contact with the media, and prepares scientists to become communicators.

COMMUNICATIONS IS IMPORTANT

A clear consensus among those interviewed is that communications efforts to profile the work of government scientists pay several dividends. First, it demonstrates the value of that work to Canadians, and to decision-makers. Second, it enhances the credibility of the individual scientist, and by extension, the credibility of government science, in the scientific professional community.

Third, it validates this scientific work among their peers. Fourth, this type of exposure challenges them as scientists to "defend" their work. As science is by definition exploratory, such exposure also enhances the scientific pursuit by initiating debate; there is rarely just one answer, and never one viewpoint. The scientific pursuit overall is improved.

INNOVATIVE SCIENCE COMMUNICATIONS

Departments are creating innovative communications tool-kits. Departmental Internet sites increasingly focus on the work of individual scientists. New multi-media products are created for targeted audiences, and the general public. Partnerships such as that between the 5NR Communications Working Group and the Discovery Channel that produces the Earth Tones vignettes bring federal science into the homes of Canadians in an informative and entertaining format.

Much work has been done in several departments to bring federal science to young people, and directly to their classrooms. We heard comments though that more creative thought has to be given to communicating science that is less visual, and thus seemingly less accessible.

Complementing new communications tools are new strategies for reaching the media, the public and other scientific communities. Just as science is increasingly conducted on a collaborative basis, so too is communications. We were told that departments are seeking more multi-layered, multi-leveraged opportunities with the private sector, the university-based research community, and other public sector players to reach their audiences. While "one-off" media events, and news releases predominate, there is increasing recognition that deeper and wider communications campaigns better sustain the message. We also heard that partnering/collaborative communications efforts are more cost-effective over the long term.

Those branches of government with agency status appear to have greater latitude in branding their science, and differentiating it from the "forest" of government science. One key characteristic of agency status is the ability to raise outside capital and enter into

investment partnerships. As a result, S&T branches with agency status will have communications opportunities with industry unavailable to line departments. This comes with the recognition that this process will result in "a house of brands", rather than a "branded house".

POPULARIZING SCIENCE

The challenge in achieving this objective is not new. As Albert Einstein once said, "Things should be made as simple as possible but not any simpler".

While scientists, policy, and communications personnel collectively question the necessity or advisability of "dumbing down the science", there was general agreement that greater efforts must be made to popularize government S&T.

While much of the S&T communications that is conducted is of the surveillance, detection, and notification variety that does not easily lend itself to popularization, it is equally true that a lack of resources and initiative may prevent this from occurring.

A critical element in creating more scientific communicators is training, particularly with respect to dealing with the media. Government of Canada scientists now have access to department-specific communications training programs. Because the media is often more interested in the policy implications of the science as opposed to the science itself, there continues to be concern among scientists of walking the line between science and politics. In these circumstances, the element of trust is paramount, and some departments have nurtured the appropriate environment better than others.

Earned media must be a key component of any communications strategy. Some departments are taking proactive approaches to package good news stories and sell their story ideas to the mainstream press. Opportunities are lost in not translating peer-reviewed work and articles from learned journals into science fare for the general population.

LISTENING TO CANADIANS

Departments utilize several different consultative models, and individual branches manage their own processes. We were told that communications opportunities during these processes may be limited by a number of factors, including concerns over the release of confidential corporate information, and the controversial nature of the scientific/technical advice being provided (i.e. assessing the toxicity of substances). This element of risk communications is exacerbated at times by hidden agendas not evident to the public or the media.

Departments believe in public involvement, inclusion, and being accountable to Canadians. However, the value of these exercises may be limited by available funding.

Intensive methods that utilize more sophisticated techniques are often unaffordable. The sheer volume of issues under discussion at any one time limits the ability of departments to coordinate activities.

Generally speaking, consultative processes are under-utilized vehicles for communicating federal S&T. While Health Canada, and Agriculture and Agri-Food Canada for example, have distinct Consultation branches, the full potential of communicating with Canadians is not being realized across SBDAs.

In some cases, audiences are narrowly defined, and while the public view is considered important, many issues are discussed within a specific scientific community.

TRANSPARENCY AND OPENNESS ARE CRITICAL

Just as the CSTA has identified transparency and openness as one of the six principles and operational guidelines as reflected in a Framework for Science and Technology[6], so too have the departments and agencies of the Government of Canada defined these principles as the cornerstone of communications. Science can only advance in the light of day; continual questioning prompts new information, and validates the explanations. Significantly, departments have different procedures for ensuring these principles are acted upon. There is strong recognition that the scientific work is conducted within a complex, dynamic policy and political environment that demands "fact" and certainty.

Canadians believe that scientific information should be trustworthy and independent. It is important though Canadians understand that fact and certainty may only exist until the next level of discovery. Canadians may wish to hear "we don't know yet but in the meantime we are taking the necessary precautions". Certainly, they will only believe this is in an environment of transparency and openness. As Dr. Kevin Keough, Chief Scientist at Health Canada stated in a speech in October 21, 2001,

> "the prospect that advice may be second guessed at some point in the future may inhibit the provision of "best available" advice today. This underscores once again, the importance of communicating what science can and cannot tell us about issues. Certainly a cautious approach to science advice and decision-making is essential. But precaution should not translate int paralysis."[7]

IS THEIR CONTRIBUTION UNDERVALUED?

We were told that there exists within the federal science community an underlying angst driven by a belief that their contribution is undervalued.

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[6] A Framework for Science and Technology Advice: Principles and Guidelines for the Effective Use of Science and Technology Advice in Government Decision Making, Government of Canada, 2000.

[7] 3rd Annual Amyot Lecture, Dr. Kevin Keough, Chief Scientist, Health Canada, October 17, 2001.

We were told that government scientists are only noticed in times of crisis. Often, communications efforts at this time cast scientists and government science in a negative light. As a result, departments may be perceived only as places where problems arise – and are solved – not necessarily as institutions where knowledge is created.

Senior scientists operate in an environment where they are conversant in government, politics, management issues, finance, communications, and policy issues, but often find that those they deal with in these other realms have limited understandings of science. As C.P. Snow wrote more than forty years ago in *The Two Cultures and the Scientific Revolution*, "politicians, administrators, an entire community, who know enough science to have a sense of what the scientists are talking about"[8], are necessary in a society seeking success in scientific endeavour.

REQUIRED: A NATIONAL FRAMEWORK

The view was expressed that measures to communicate government science would be strengthened by more clearly articulated national science and technology objectives. It was felt that clear, consistent, and coordinated objectives would bring federal scientific efforts into clearer focus with the public, and assist the value for money argument that senior departmental officials, and parliamentarians must continually make in resource allocation exercises.

FRAMEWORKS, STRATEGIC MARKETING, COMMUNICATIONS WORK PLANS

We were shown communications frameworks, work plans, scientific strategic plans, and science marketing plans. The only consistency was they were all different. One should not expect uniformity between such large organizations but the degree of differences was surprising.

Though few science communications frameworks exist – Environment Canada a key exception – some departments have or are working to develop strategic marketing plans to guide their science communications.

INTERNAL COMMUNICATIONS

We were told that internal changes – structural and attitudinal – are essential complements to science communications plan. Departments recognize that communicating the message internally may be a necessary prerequisite to success in mass communications.

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[8] C.P. Snow, The Two Cultures and the Scientific Revolution, The Rede Lecture, 1959.

WITHIN DEPARTMENTS

Departments realize that not only is the public unaware of scientific accomplishment, often colleagues in the same department are equally unaware of work in other branches. Steps to address this concern include intra-net sites that highlight individual achievement, and more substantive employee newsletters.

The size and structure of some departments mitigates attempts to improve internal communications. Again the problem is well recognized but common mission statements prove difficult to achieve. Similarly, it was recognized that a corporate brand may be the most effective vehicle for increasing public profile but branch loyalties die hard, and competition appears rife, not only between departments but within them.

Materials collected during this survey suggest that those produced within a corporate model are superior in quality and consistency to those produced by smaller branches. However, we were told of resistance to some efforts to create a corporate model of communications.

BETWEEN DEPARTMENTS

Departments compete for resources, and profile. As noted, this competition may be intensified by the lack of an overall national S&T policy framework. In the absence of clear national objectives within such a framework, we were told that departments are forced to "micro-communicate" their own initiatives, and in the blizzard of releases and events, any national objectives and broader achievements are lost.

The 5NR and its many working groups including communications, is a model of inter-departmental cooperation and coordination. However, if one were to measure relative value by budgets alone, this vehicle, particularly with respect to the Communications Working Group, is undervalued.

LINKING SCIENCE AND POLICY WITH COMMUNICATIONS

Departments are enacting a number of internal changes to support cultural changes in openness and communications. In addition to external experts strengthening science advisory boards, at least one department counts a science journalist among its members. Departments are strengthening the internal science policy/communications interface by facilitating close interaction between the intra-departmental committees on science management and on communications. The Best Practices section of this report highlights structures built by the Department of Fisheries and Oceans to facilitate the top-down and bottom-up flow of information, and improve coordination between science, policy and communications branches.

There is a latent concern that senior decision makers in the government lack awareness about the nature, and content of federal science. Efforts to correct this situation would be welcomed within the scientific corps and beneficial to the decision making process. The *Bacon & Eggheads* breakfast lecture series held on Parliament Hill is seen as an excellent forum to promote a dialogue between scientists, politicians, and senior public servants. It should be noted however that federal science is not always at the top of the lecture series' agenda.

While outside the scope of this survey, policy makers may wish to look at an initiative of The Royal Society in the United Kingdom. A recent MP-scientist pairing initiative helps scientists understand the pressures under which MPs operate and helps MPs understand the scientific mindset. It also allows MPs to forge more direct link into the scientific community that will have long-term benefits.

This program includes reciprocal visits between the constituency and the laboratory, and scientists spend a week in Parliament learning about Parliamentary procedure, and the legislative process. Organizers focus on recruiting scientists with a proven interest in science communications and matters related to science policy.

Structural and attitudinal change takes time, and as with so many aspects of communication, the urgent crowds out the important, often leaving these changes for another day.

RISK DOES NOT = CRISIS

Clearly, each department surveyed practices risk assessment, management and communications. While guidelines for scientific advice may exist, it is less clear that communications in these circumstances are guided by accepted principles and protocols. For the purposes of our survey, we have defined such a situation exists where: there is significant scientific uncertainty; there is a range of scientific opinion; and there are potentially significant implications for sensitive areas of public policy[9].

Science cannot always provide conclusive answers about the nature and extent of risks, but public confidence depends upon these risks being communicated. Accountability structures can leave individual scientists exposed, particularly where public health and safety is at issue.

While guidelines for who should speak when, are fairly well established, rules governing what should be communicated are less well established. It is imperative then that departments and agencies produce principles and guidelines for communicating risk.

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[9] Guidelines 2000: Scientific Advice and Policy Making, Office of Science and Technology, Government of the United Kingdom, July 2000.

We were told that the government must first define risk communications. At the same time, it is important to distinguish between risk communication and crisis communications, and develop appropriate principles and guidelines. For instance, early identification is a necessary precept for risk communications. On the other hand, crisis communications by its very nature precludes advance notification.

THE UNIVERSAL CONCERN - $$

A universal concern among those interviewed was the question of resources; both financial and personnel. Communications budgets are constrained throughout the Government of Canada, but funds to profile scientific endeavours appear particularly tight.

Explanations for a lack of emphasis in this area include difficulties in expressing some concepts in the popular press, a perceived lack of interest among the mainstream press in scientific issues, and the absence of science-specific strategic communications plans in which to project expenditures.

PRINCIPLES

Our interviews told us that science communications is conducted in much the same manner as general government communications. Guided by Treasury Board communications policies and internal guidelines, we found that department and agencies strive to be open and transparent, anticipate communications opportunities and challenges, link their science to broader policy objectives, and accurately describe the social and ethical consequences of their research. However, most departments and agencies do not appear to operate with clearly articulated communications principles in mind.

Environment Canada (EC) has taken the initiative to develop a science communications framework. In 1998, Environment Canada's Science and Technology Advisory Board focused on science communications, and initiated a process to provide advise in this regard to the Deputy Minister. Spearheaded by a Working Group on Science Communications, the Advisory Board undertook a "lessons-learned" analysis of significant environmental issues dealt with by the department in the past.

One such review examined the department's communications response to the issues of acid rain and the depletion of the stratospheric ozone layer. The Advisory Board requested that the department prepare short case studies based on document reviews and interviews, as well as literature reviews and media scans. The goal was to identify common elements, as well as differences associated with the two issues in the following respects:

- the key communications messages;
- strategies and tools used by the department;
- successes and failures;
- the media's role in communications; and
- the effects of the public's issue attention cycle on science communications

A key lesson learned was that particularly with respect to acid rain that there was a clear difference between communicating about an environmental issue, and communicating the science associated with an environmental issue. Officials very quickly found themselves moving from explaining the science to communicating the policy responses required to address the issue. The overall objective of the review was to provide the basis upon which the Advisory Board would develop a science communications framework for the department.

The *Science Communications Framework for Environment Canada* was released in March 2000. The Framework highlights a number of key science communications challenges, and advantages of science communications. These advantages include:

- To ensure communication of the most accurate information possible.
- To help the public in decision-making.
- To influence public policy.
- To promote a higher level of scientific awareness among Canadians and encourage future scientific efforts.
- To make scientific results useful to Canadians.

In addition to this list of advantages/benefits of effectively communicating government science, those we spoke to added two others. One, federal scientists are increasingly trying to accomplish more with the same amount of funding. While reluctant to complain, there was clearly concern that new federal resources were not going to established federal science institutions. Second, there is a recognition that the image of federal science does not burn as brightly in the public's mind as that of industry and academe, and particularly so in the minds of aspiring young science students. Yet, it is imperative that the federal government be successful in recruiting large numbers of Canada's brightest young minds.

The Framework identifies seven key principles that guide the department's science communications activities. They are:

- Taking an anticipatory and precautionary approach.
- Encouraging participation.
- Generating influence through credibility.
- Pitching messages at the right level.
- Providing perspective.
- Linking to the policy context.
- Strengthening the relationship between scientists and professional communications.

In April 2002, the Treasury Board Secretariat released the *Communications Policy for the Government of Canada*. While defining policy objectives, and a policy statement, the document does not include a set of principles. Best practice guidelines will be developed over time in seventeen subject areas and published as annexes to the document. While each of these subject areas are obviously relevant to science communications, several have special resonance for this study. They are: crisis and emergency situations; marketing; risk communications; media relations; and partnering, collaborative arrangements and sponsorship.

RECOMMENDATION

That departments conduct an internal process to develop a guiding set of principles. With due credit to Environment Canada, the following are recommended as the basis for a science communications framework.

- Ensure transparency and openness
- Ensure public involvement
- Take an anticipatory and precautionary approach
- Provide impacts perspective
- Pitch messages at the right level
- Seek partners and practice innovation

FORESIGHT

Close attention to the broad scientific community is required to identify and prepare for emerging and potentially controversial S&T related issues. Two decades ago, a much higher proportion of research conducted in Canada was done in government labs. Today however, a greater percentage is conducted in the university sector and industry.

Departments therefore increasingly seek out partners in these sectors to contribute as members of science advisory boards, and advisory committees to individual research units. The value of these advisory bodies is enhanced with a greater degree of autonomy, and by installing co-chairs from outside the government. The Department of Fisheries and Oceans is highlighted in the Best Practices section of this report.

Collaborative research initiatives have produced new "early-warning" partnerships where it is clearly in the interests of all – and coincidentally the public interest, to anticipate issues. Departments utilize technology watch processes, and attempt to stay ahead of the curve through participation at international conferences, and through the structures established under inter-country technology agreements.

Departments reported an array of consultative tools, in addition to public opinion polling, utilized to prepare a government response to issues, controversial or otherwise.

Departments are also taking steps to strengthen the science/policy linkages in their departments, such that communicators have a richer, more nuanced story to tell. Relational changes like these will likely shorten the "ramp-up" when controversial issues inevitably surface.

Much work remains to be done though. When asked at which stage communications is brought into the picture, one response was stark: "when I see it (the issue) on TV". A daily reality is that a lack of resources combined with a paucity of strategic planning almost always results in the urgent crowding out the important. The long-term strategic work does not get done because of the fire-fighting requirement.

We found little evidence of clearly articulated risk communications plans and strategies. As a result, departments react on an ad-hoc basis with the amount of time required to react inversely proportional to the level of intra-departmental cooperation, and engagement between the science, policy and communications sectors.

RECOMMENDATIONS

Autonomy on departmental advisory boards should continue to be encouraged.

Departments should examine ways to further link their science, policy, and communications functions.

Public involvement processes are under-utilized as vehicles for communications. It is also not clear that the information gathered is used for anticipatory planning. Internal mechanisms should be established to ensure that the valuable information gathered through engaging Canadians is used to its full potential.

ONGOING DIALOGUE AND CONSULTATION

There is little question that the departments and agencies focused on the pursuit of science embody the principle of dialogue and consultation with Canadians. They recognize that the government is expected to engage Canadians, listen to their views and take them into account in devising public policy. Each of the entities we examined have multi-layered approaches in place to consult stakeholders and clients, to receive both general research advice, and advice on strategic research directions, and to communicate with the general public.

However, much of this work takes place in the absence of department-wide coordination. Health Canada is one of the exceptions. Highlighted later in this report as a Best Practice, the department has established a Consultation Secretariat, and developed a *Policy Toolkit for Public Involvement in Decision Making.*

Science advisory boards are the rule with strong stakeholder representation. In addition, departments benefit from the expertise and input of other project or issue specific external advisory groups and committees. Further input is sought through ad-hoc mechanisms such as peer-review panels and special forums.

In the addition to the objectives noted above, external advice is increasingly important in generating private sector investment for agency-based S&T, fostering closer ties with industry and universities, and developing new avenues and opportunities for communications.

As a general rule, departments have open and transparent working relationships with their clients. It was felt that the relationships often become guarded when confidential corporate information enters the discussion and is critical to that outcome.

Departments avail themselves of a variety of consultative tools and mechanisms. Those that have adopted a client focus, and seek multi-leveraged partnerships tend to have more prescriptive consultative practices.

For example, the National Research Council has created a sophisticated, multi-stage process to build public and corporate support for the development of regional and community-based technology clusters. In each case, the proposals are continually refined through consultation process in response to the community's needs.

The steps include meetings and workshops at the community level that link local and national players, and define the community's strengths with respect to technology, business, finance, research facilities and other infrastructure. Innovation roundtables engage community leaders in defining ways of capitalizing on local strengths.

The feedback mechanism following the roundtables is particularly impressive. Roundtable reports detail key outcomes, challenges for the community, linkages for success and recommend immediate next steps. These reports are given wide circulation in the community among opinion leaders.

An action plan is then developed with the community that outlines the vision and strategy, identifies local champions, and provides a roadmap for development over the long term. The action plan is then moved to reality through R&D, and infrastructure development. While communications occurs throughout the process, the launch of the technology cluster is supported by communications initiatives that reach global science networks.

RECOMMENDATIONS

Clearly, the desire among Canadians to become involved in public policy decision making is not going to diminish; if anything, desires will increasingly become demands. Therefore, it would at the least, be prudent for departments to develop consultation principles and policies, with communications guidelines.

The Health Canada model would be an ideal outcome, however more modest achievements in this area would still represent a positive improvement. At the very least, departments should develop strategic plans that include communications techniques at every stage of public involvement.

Leadership must also come from the highest levels of the government, in particular, the Privy Council Office and the Treasury Board. Public cynicism will only increase if the government does not meet its stated vision on citizen engagement.

COMMUNICATING FINDINGS AND RESULTS

We found that departments are creating increasingly innovative communications tool-kits. Where once communications was dominated by press releases, media briefings, and one-off events, the trend today, particularly with respect to science is communication not to but with, the consumer – who not coincidentally is as often considered a client.

As noted, we have been told of Canadian's appetite for, and interest in science. Canadians want more information; in order to be better informed about the world around them, and

a basis upon which to sort and assess the volume of information presented to them by governments, industry and advocacy groups.

Canadians want real-time access to that information. They are not content to wait for published material to arrive in the mail. And they want the information sources to be interactive, not static. The departments and agencies we talked to have already moved aggressively in this direction. For example, the National Research Council (NRC) provides hundreds of thousands of copies of the periodic table of elements to high school students. At the same time, the NRC is posting pages of the individual elements on their website so that students can study on-line.

Canadians' desire for more information, and the growing demands for content in the new media formats have created new opportunities for government science to be communicated, and provided the catalyst for new types of joint ventures and partnerships. As noted, the 5NR Communications Working Group coordinates the production of the *Earth Tones* vignettes that not only profile government science but also highlight the individual government scientists at work. Canadians are far more likely to recall an issue and its significance if they remember the individual that presented it to them.

The vast majority of Canadians get their news through the mass media, in print and ever more so on television. However, business conditions in that industry have resulted in contraction and convergence, often leaving science as an orphan issue. Few journalists have science backgrounds and observers comment that those covering these issues appear to have little time to delve into scientific issues in a substantive fashion. Many smaller, regional media outlets simply do not have the resources to adequately cover national science issues. Departments have addressed this reality by making more scientists available to the media for comment and deep background.

Environment Canada (EC) publishes a bi-weekly tip sheet that alerts the media to scientific issues and provides direct contact to the scientist working on the issue. EC also produces pre-recorded radio clips on current environmental issues in both official languages, and distributes them widely across the country.

Environment Canada's suite of communications products is highlighted in the Best Practices section of this report.

It is an accepted fact that communication and media training for scientists has significant benefits: for the individual scientist, the department or agency that employs them, and the overall level of awareness of government science among the broader population. Specialized training for scientists is now being conducted in several departments.

The NRC has taken this aspect of specialization one step further by participating in the Canadian Council of the Arts, "Artist in Residence" program. While this collaboration will team researchers and artists, one can imagine that new concepts arising from the synergy of

these two cultures hold tremendous possibilities for enlivening communications approaches.

Canada Research Horizons is new entrant into the magazine market. Intended to profile the work performed and funded by the federal science-based departments and agencies, the magazine is a glossy, full colour, highly readable exhibition of the science and especially, the people responsible for the science. The magazine shouts that government science is valuable, and interesting.

Currently circulated within the federal government and among key industry and university partners, we heard that the magazine has already made an important contribution to raising the profile of sciences within departmental walls. This has an important morale-boosting effect, and may offer opportunities for spin-off features in the mainstream press. Suggestions were made that the distribution of the magazine should be broadened, for instance placing it on airlines would allow it to reach new audiences.

Generally speaking, departments and agencies have lengthy menus of communications products for the media, and the general public. Guidelines have been established for formats, content, spokespersons, look and feel, and media relations. It is less evident that departments have stepped back from the function of science communications to examine the conceptual underpinnings that should guide the function.

One exception is the *Science Communications Framework for Environment Canada*. While several departments are in the process of preparing science- marketing plans, it is not clear what eventual shape they will take. Similarly, we found little evidence that departments have fully examined the issue of communicating risk, and provided their scientists with principles and guidelines in a consistent framework.

RECOMMENDATIONS

Departments have put in place communications/media training programs. Important skills and knowledge are developed as a result. Those that build upon their training and communicate with the public and the media are performing a valuable service for their department and the Government of Canada. This effort and service should be reflected in annual performance reviews, and rewarded in an appropriate manner.

Departments should develop science communications frameworks or plans that contain a solid marketing component. Given the potential for working at cross-purposes, this work could be monitored through existing inter-departmental committees on science or communications.

Departments should develop risk communication policies that are clear and consistent.

Departments should evaluate the potential benefits of establishing communications branches focused on science. This is not to suggest fencing these issues off from larger

departmental objectives but as a way of placing a greater emphasis on science in day-to-day communications.

Departments should promote "good news" in a more pro-active fashion. Integral to this is a marketing plan that emphasizes earned media.

Just as partnerships hold new promise for scientific collaboration, so too do they open new avenues of cooperation with respect to communications. A key element of any partnership arrangement must be appropriate profile for the federal science component. Departments should investigate internal adjustments that strengthen their client-focus, and afford new communications opportunities.

REVIEW AND IDENTIFICATION OF NEW ISSUES

There was no disagreement on the importance of science communications, and given the resources devoted to this area, a genuine desire to communicate in an effective, efficient manner. With respect to views on the outcomes of effective communications, there was strong approval of those put forward in the interview guide:

- Increase public confidence
- Support better decision-making by politicians and administrators
- Greater support among decision-makers for government science.

In the framework document produced by Environment Canada, other beneficial outcomes of effective communications include:

- Ensuring the most accurate information possible is communicated. This addresses the problem of the proliferation of "junk science" particularly on the Internet where validity cannot always be assured.
- To help the public in decision-making. Increasingly, responsibility for decision-making is being shared by a wider range of individuals and institutions. This broader responsibility requires increasingly sophisticated information.
- To promote a higher level of scientific awareness among Canadians and encourage future scientific effort. If the public understands and places confidence in science, it will support ongoing research.
- To make scientific results useful to society. Increasing public awareness about a particular issue is often the first step in a process of change. Science

communications are most effective when people translate awareness into personal decisions that can change their lives and the lives of others.

As noted earlier, effective communications is vital for those agencies that have the operational flexibility to seek out funding partners, raise private capital, and capitalize on their scientific research. To fail to do so is to welcome failure.

Even in the absence of such operational flexibility, it is important that the science community be aware of the work that is being done in government labs.

To accomplish this, communications must move beyond the science. For example, we were told the focus of communications at the National Research Council (NRC) is not on the science - though science is necessarily at the core - but on "communicating futures". By linking science to broader objectives - economic and social development, and new opportunities for communities for instance - the NRC is better able to demonstrate the importance and value of the science to Canadians.

Promoting science effectively is promoting the raison d'être of the science-based departments and agencies. It is a key component of promoting the department itself. It will also be critical to attracting the new generation of government scientists.

Effective communications can have a tremendous impact on the responsibility of several departments to safeguard public health and safety. It is one thing to do a poor job of announcing funding; it is quite another to fail to adequately inform the public of emerging health risks, for example.

There are a number of means by which departments elicit feedback from their stakeholders. Targeted public opinion surveys provide general feedback, while at the other end of the spectrum, peer review panels provide specific feedback on the work of individual scientists.

Government scientists also publish their work in a bewildering (to the initiate) array of learned journals and publications. The feedback here would be unintelligible to the average citizen but is a vital component of scientific debate and discovery.

Finally, government scientists avail themselves of the opportunity to attend symposiums, colloquiums, and other fora.

Although departmental accountability and performance measures typically quantify elements of stakeholder feedback, it is not clear whether the feedback loop is closed and the information gathered ultimately informs issue-identification procedures or measures to improve communications.

RECOMMENDATIONS

Departments should take steps to ensure that stakeholder feedback is gathered in a manner that facilitates communications planning and execution.

Departments should develop measures that will allow them to evaluate the effectiveness of the communications activities they undertake.

APPENDIX A: BEST PRACTICE - FORESIGHT

DEPARTMENT OF FISHERIES AND OCEANS

While departmental science advisory committees are the norm, the Department of Fisheries and Oceans (DFO) has taken a number of steps that not only improve its ability to anticipate issues but also increase the level of interaction between the science and communications branches of the department.

DFO established the Science Advisory Council (SAC) in 1997 to provide advice on broad strategic matters in S&T. Key elements include:

- Advice on strategic research direction and collaboration with actors outside government
- Advice on the direction, balance, and relevance of DFO's S&T priorities
- Assist in integrating national S&T issues arising from other DFO advisory bodies into the broader agenda of the department
- Provide a challenge function to DFO programs and decision making

SAC is comprised of 15 members, selected for their expertise in key sectors and disciplines with due consideration for regional and other factors. While reporting to the ADM of Science, SAC is chaired by an external member.

SAC helps identify and refine DFO's science priorities but does not evaluate the department's in-house scientific activities. Recommendations are reached by consensus, and while they are generally not made public, members are not bound by a confidentiality agreement.

DFO has also established a number of internal working groups that facilitate a two-way flow of information between the scientific, and communications branches. These include:

- National Science Directors Committee
- Internal Science Advisory Committee
- National Science Communications Committee (NSCC)

The latter group is comprised of Science Liaison officers as well as communications staff from each region and Headquarters. Significantly, the Science Liaison officer positions were created to enhance communications. Planning calendars (the International Planning Calendar, and the Departmental Planning Calendar) help identify and prepare for emerging and potentially controversial S&T issues.

These internal committees are complemented by regional, zonal, and national advisory processes that continuously feed information to regional offices and headquarters. In addition, DFO benefits from having thousands of employees on the ground in the regions of this country.

APPENDIX B: BEST PRACTICE - ONGOING DIALOGUE AND CONSULTATION

HEALTH CANADA

Health Canada (HC) has produced a lengthy, detailed *Policy Toolkit for Public Involvement in Decision Making*. The toolkit was designed in response to a departmental desire to ensure that the concerns and interests of Canadians, in addition to health professionals, were taken into account on the wide variety of issues that comprise Health Canada's mandate. The toolkit assists the departmental in actualizing the Government of Canada policy commitment to engage Canadians. The title of the document itself illustrates that the department believes this responsibility goes beyond consulting Canadians to involving them in the decision making process.

Published in 2000, the toolkit sets out departmental expectations, roles and responsibilities with respect to public involvement. The work was initiated by the HC Management Council and produced by a number of inter-branch subcommittees focusing on issues such as: policy frameworks and guidelines; training and information needs; focus group organization; ensuring departmental buy-in. The approach was approved by the Departmental Executive Committee, and benefited from the support of champions at senior levels in the department.

The toolkit is guided by a vision statement, and policy framework with key principles. These principles include:

- Public involvement is integral to decision making and providing quality service
- Public involvement activities improve knowledge and understanding of health issues through dialogue
- Health Canada is open to hearing the views of Canadians and providing timely feedback on the outcomes of dialogue
- Public involvement must reflect the diversity of Canadian's values and needs
- Dialogue must be transparent, accessible and coordinated
- Health Canada will provide training in support of employees responsibilities and accountability with respect to public involvement activities

The toolkit utilizes a continuum of public involvement highlighting five levels of progressively deeper and sophisticated engagement. These levels range from informing or educating the public to full partnership in decision-making. Characterized by a growing level of input and impact by the public, the essence of the activities move from communications to listening, to consulting and engagement to partnership.

The toolkit provides practical guidelines for planning, designing, implementing and evaluating a wide range of public involvement techniques. Also included are relevant case studies, and resource persons for further information. Each level of activity includes a list of reference materials and recommended communications activities.

In addition to producing the toolkit, Health Canada has also established a Consultation Secretariat. Given the high volume of public involvement exercises throughout the department – 150 within a three-to-six-month snapshot - the Consultation Secretariat is not in a position to coordinate them but serves as a knowledge node within the department.

There are several positive outflows from this initiative. Health Canada has sponsored a speaker's series on public involvement that has raised the profile of this vital component of public policy making both within the department and in other areas of the Government of Canada.

A training program initiated for departmental employees has introduced communications techniques to a wide audience in the department. External experts have validated this framework, and the accumulated knowledge base has resulted in the establishment of a virtual centre of expertise on public involvement within Health Canada.

It is not clear that the Health Canada model may be easily replicated across other departments. The culture must be accommodating and the support of management officials at the highest levels is required for success. The Health Canada process was driven from within and thus a nucleus of committed individuals is an absolute necessity.

APPENDIX C: BEST PRACTICE – COMMUNICATING FINDINGS AND RESULTS

ENVIRONMENT CANADA

S&T is an integral component of Environment Canada (EC), and the basis for policy development in the department. Given the diversity of science undertaken within the department, it should not surprise anyone to see the range of tools developed for

communicating S&T. EC has successfully integrated the concept of science communications on a variety of environmental issues into this toolkit.

As noted earlier in the report, EC is the only department to develop a comprehensive science communications framework. While it is beyond the scope of this survey to determine the true extent to which communications is guided by this framework, the drive to succeed in science communications that resulted in this framework has evidently also been the catalyst for an innovative universe of communications products.

Environment Canada demonstrates a culture of openness that is not universal throughout the government. Scientists are encouraged to deal with the media and the department has led the way in providing training to facilitate this relationship. A journalist co-chaired the process that developed the science communications framework, and a science writer currently sits on the department's Science and Technology Advisory Board.

In addition to conventional media products, EC has developed tools for a broader range of audiences and mediums that afford greater exposure to science/environmental issues.

GREEN LANE (*WWW.EC.GC.CA*)

The department's *Green Lane* Internet site contains sub-sites that provide access to a wide range of scientific issues. The *Focus on Science and Technology* sub-site highlights the department's approaches to managing S&T. Like other departments, the site details research facilities, and projects of interest.

However, unlike other departments, EC has created an *Our Scientists* site that profiles individual EC scientists and their work. Complete with professional biographies, photo, work contact information, and summaries of past and current work, the site brings the scientist and their work to the public. This site also provides the media with quick information on appropriate contacts in the department.

One objective of communicating S&T is that government departments must go beyond informing and educating the public to inspiring individual decision-making and action. The *What You Can Do: Down To Earth Choices for Sustainable Living* sub-site contains practical examples of how Canadians can make changes in personal routines that will have beneficial impacts on their environment.

EARTH TONES (@DISCOVERY.CA)

Initially developed by EC in 1996-97, the partnership with the Discovery Channel that produces the Earth Tones vignettes is currently administered by the 5NR. Airing on Discovery's flagship science news magazine program, *@discovery.ca*, these 6-9 minute vignettes showcase federal S&T activities.

ENVIRO TIPSHEET

This bi-weekly product, faxed to the media across Canada on a bi-weekly basis, provides a snapshot of story ideas. The Tip sheet contains a contact name and phone number for each item, providing easy access to the press for more information and context.

PLANET UPDATE

Termed the "radio cousin" of the Enviro Tip sheet, Planet Update is a monthly audio show of four 60-second stories distributed by cassette, c-d format, reel-to-reel, as well as by satellite through Broadcast News to radio stations across the country. More than 100 stations receive the programs each month, with a positive English/French split. Audiences range from the tens of thousands to hundreds of thousands per station.

Distribution will be enhanced this fall by moving to a Web distribution system with MP3 files. EC is also planning to conduct a users survey to more accurately determine the reach of the programming.

SCIENCE AND ENVIRONMENT BULLETIN

The Bulletin is a bi-monthly, 8-page print and on-line publication that brings EC's science and environmental policy to Canadians in a detailed fashion. Fact-laden, the Bulletin appears to be aimed at an audience with specific S&T interests.

ENVIROZINE

EC's on-line magazine is produced every three weeks, presenting S&T in a dynamic and colourful fashion. A feature of EnviroZine is the Inside Track, a sub-site that groups Enviro Tip sheet, Planet Update and S&E Bulletin in one location, providing reliable and comprehensive information for the public and the media.

THE 5NR COMMUNICATIONS WORKING GROUP

The 5NR is a model of inter-departmental cooperation and coordination, and provides both a vehicle for current initiatives, and a template for future horizontal projects.

The 5NR initiative began in 1995 with the signing of the first Memorandum of Understanding (MOU) on Science and Technology for Sustainable Development in the Natural Resources Sector by the original four parties to the agreement (Agriculture and Agri-Food Canada, Environment Canada, the Department of Fisheries and Oceans, and Natural Resources Canada). The MOU has been renewed twice since then, and expanded to include Health Canada.

Interdepartmental working groups have been established with membership chosen on the basis of the issues the group is focusing on. These working groups report to a DG Committee with overall leadership provided by the ADM Steering Committee.

In 1997-98, science-based departments became seized with the importance of communicating the role of federal S&T and its value, in particular the vital role in influencing policy decisions. A list of initiatives that could be commonly communicated was compiled, and the 5NR Communications Working Group (hereafter referred to as the WG) was tasked with vetting the list of initiatives, establishing priorities, and determining funding levels required.

The resulting communications strategy had the following objectives:

- Make Canadians more aware that the federal government is among national and international leaders in science and technology
- Share, within the federal government, the best practices of S&T communications
- Share, within the federal government, information on key issues and how they apply to the S&T community
- Increase awareness of federal S&T activities, and the value of those activities in the formation of policy and other government roles, among decision makers inside and outside the federal government
- Increase the level of awareness of S&T among young people who are considering science as a career.

As a collaborative effort of five departments, the WG depends upon the signatory departments for its annual budget of $250,000. Among the initiatives undertaken by the WG is a continuance of the partnership agreement with the Discovery Channel to produce the Earth Tones vignettes, and the development of communications training programs for scientists.

Initiated by Environment Canada in 1996-97, the Earth Tones vignettes are an excellent vehicle for highlighting federal government S&T, and the scientists behind the innovations. A review of this initiative found that for an investment of about $140,000, the WG acquired television exposure through the vignettes that would have cost between $560,000 and $920,000 as paid advertisements during the period 1999-00, and 2000-01.

In addition to broad media/communications training, the WG has also developed a workshop on risk communications. To date, more than 500 federal science personnel have attended workshops designed to give them the knowledge, skills and understanding necessary for an effective relationship with the media.

Furthermore, departments have adapted these training modules to address specific needs and regional concerns. For example, the communications branch of Fisheries and Oceans Maritime Region has developed a one-day media-training program for all staff. In the Newfoundland Region, a more intensive two-day program has been developed for staff that have had limited experience with the media.

The 5NR process is not without its challenges. As noted, the budget of the Communications Working Group is just $250,000. Compounding this is the fact that departments have on occasion in past years been late in transferring their funding commitment to the WG.

Participants on the WG must, understandably, fulfill their day-to-day work responsibilities in their home departments. However, the potential of the WG is likely limited by the need for individual members to balance their contribution with commitments to their departmental jobs.

APPENDIX D: INTERVIEW GUIDE

GENERAL

1. What area of science brings you into the greatest contact with the public?

2. What would you say are the benefits of effectively communicating the value of government S&T, and what are the risks if you don't?

3. Does your department have established objectives for communicating science?

FORESIGHT

1. What types of activities are undertaken to identify and prepare for emerging, or potentially controversial S&T-related issues?

2. For DG Communications. - How soon is communications brought into these discussions, and does the timing depend upon whether the issue is being dealt with in a pro-active or reactive fashion?

3. What mechanisms are used to stimulate and engage stakeholders in early debate of these critical issues?

ONGOING DIALOGUE AND CONSULTATION

1. What mechanisms does your department use to engage stakeholders in an on-going dialogue on a particular S&T issue, and is there a model that you particularly like?

2. How do you believe your stakeholders would characterize the working relationship with your department? (eg. open, transparent or guarded?)

3. What, if any, communications activities do you undertake in the consultative stage? Is the target audience strictly the community being consulted?

COMMUNICATE FINDINGS/RESULTS

1. Generally, how are your scientific findings communicated?

2. How are scientific uncertainty and science-based risk communicated? Do you follow guidelines for determining how to present the uncertainties associated with science?

3. For ADM Science: Understanding the complexities of your research, are you concerned at all that some of the detail and texture of your department's work may be lost in the communications process?
4. For DG Communications: Do you feel that there is too much science to communicate? How do you choose what is highlighted?

5. How are scientific results, including data from monitoring programs, made accessible to the broader scientific community, stakeholders or audiences?

REVIEW AND IDENTIFICATION OF NEW ISSUES

1. What do you believe are the outcomes of effective communications? (eg. public confidence, better decision-making, support for initiatives within "the system")

2. What mechanisms are used to determine the effectiveness of your department's S&T communications?

3. Do you have mechanisms for encouraging/eliciting feedback from stakeholders?

4. If yes, how do you use this feedback in the identification of new issues or in improving communications practices?

APPENDIX E: LIST OF INTERVIEWS

ENVIRONMENT CANADA

Mr. Phil Kinsman, Director General, Communications and Outreach Programs

Mr. Paul Hempel, Senior Advisor, Communications

Dr. Philip Enros, Director, Science Policy Branch

NATURAL RESOURCES CANADA

Dr. Yvan Hardy, Assistant Deputy Minister (Canadian Forest Service)

THE 5NR COMMUNICATIONS WORKING GROUP

Ms. Le'Anne Frieday (Chair), Account Executive, Corporate Communications Services Division, Natural Resources Canada

Ms. Sharon Rudnitski, Director, Strategic Promotion, Agriculture and Agri-food Canada

Ms. Heather Cloutier, Senior Communications Advisor, Innovation, Agriculture and Agri-food Canada

Dr. Philip Enros, Director, Science Policy Branch, Environment Canada

Ms. Michele Gauthier, Senior Policy Advisor, Science and Technology Management Branch, Department of Fisheries and Oceans

Mr. Pierre Boucher, Senior Policy Advisor, Federal Science and Technology Community Management Secretariat, Department of Fisheries and Oceans

Mr. Don Monet, Communications Officer, Safe Environments Programme, Health Canada

HEALTH CANADA

Ms. Sheila Watkins, Director General, Communications, Marketing and Consultation Directorate

Dr. Paul Gully, Senior Director General, Population and Public Health Branch

Ms. Catherine Auger, Director, Consultation Secretariat

NATIONAL RESEARCH COUNCIL

Mr. Robert Laliberté, Director, Corporate Communications

Mr. Robert James, Director, Policy, Planning and Assessment Directorate

DEPARTMENT OF FISHERIES AND OCEANS

Dr. Wendy Watson-Wright, Assistant Deputy Minister, Science

Ms. Myriam Brochu, A/Director, Client Services, Communications Directorate

Mr. Ed Owen, Team Leader, Science and Oceans

Ms. Michele Gauthier, Senior Policy Advisor, Science and Technology Management Branch

DEPARTMENT OF NATIONAL DEFENCE

Dr. John Leggat, Assistant Deputy Minister (Science and Technology)

Dr. Ingar Moen, Director of Policy (Science and Technology)

Ms. Elaine McArdle, Director of Communications (Science and Technology)

APPENDIX F: LIST OF PUBLICATIONS

5NR

- Earth Tones... The Book
- Earth Tones... CD
- 5NR Biennial Report for 1999-2001 – Science and Technology for Sustainable Development

- Review of 5NR Communications Initiatives (conducted by Review Directorate, Department of Fisheries and Oceans)
- 5NR Communications Working Group, Work Plan 2001-2002

HEALTH CANADA

- It's Your Health
- Policy Toolkit for Public Involvement in Decision Making

ENVIRONMENT CANADA

- EnviroZine - Environment Canada's on-line newsmagazine
- Enviro Tip sheet
- Planet Update
- S&E Bulletin
- Let's Talk Green
- Zephyr
- Communicating Science at Environment Canada - Working Paper Series
- Advertising Supplement - Acting Today for Tomorrow
- Science Communications Framework for Environment Canada

FISHERIES AND OCEANS CANADA

- Underwater World
- Wavelengths
- Setting the Course for the New Millennium - A Strategic Plan for Fisheries and Oceans Canada
- Dive into The Mystery of Science - information folder

NATURAL RESOURCES CANADA

- Plant Hardiness Zones handout (In collaboration with Agriculture and Agri-Food Canada)
- Plant Hardiness Zones poster (In collaboration with Agriculture and Agri-Food Canada)
- Working Together Towards Solutions

NATIONAL RESEARCH COUNCIL CANADA

- Science at Work For Canada (Vision 2006)
- The Halifax Round Table Proceedings - Linking Nova Scotia Life Sciences Initiatives
- From Discovery to Innovation... NRC at Work in Atlantic Canada
- From Discovery to Innovation... NRC at Work in Alberta
- From Discovery to Innovation... NRC and Regional Innovation
- From Discovery to Innovation... Taking Technology to Market
- From Discovery to Innovation... Building Technology Clusters: The NRC Models
- NRC Global Reach - Local Touch
- Periodic Table of the Elements poster
- Periodic Table of the Elements handout
- Time After Time
- Canada Skies poster
- Global Reach Local Touch - Atlantic Canada Technology Clusters 2000-2001
- Creating New Companies poster
- Technology Licensing poster
- NRC Resources CD
- NRC Annual Report 2000-2001 - Value for Canada

OTHER RELATED PUBLICATIONS

- Canada Research Horizons - Your window on federal science and technology (Winter 2001/02, Spring 2002)

POPULAR PUBLICATIONS

- Canadian Living (July 2002) - 10 Scientists who could save your life
- Canadian Geographic - Annual Environment Issue